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# A New Species of *Pera* (Euphorbiaceae) from Amazonian Brazil

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**ABSTRACT.** A new species of Euphorbiaceae from the Brazilian Amazon, *Pera eiteniorum* Bigio & Secco, is described and illustrated. This species is closely related to *P. tomentosa* (Benth.) Müll. Arg., *P. membranacea* Leal, and *P. heteranthera* (Schrank) I. M. Johnst., but can be distinguished from them by the following characteristics: the abaxial leaf surface with stellate trichomes and the blade midvein with stellate-lepidote trichomes, staminate flowers with the calyx glabrous or rarely with sparse, sericeous trichomes, and a well-developed rudimentary pistillate flower with a lageniform (flask-shaped) ovary, triangular stigma, and narrowly oblanceolate staminode. Affinities of the new taxon are discussed, and a key to morphologically similar species from Amazonian Brazil is presented.

**RESUMO.** Uma nova espécie de Euphorbiaceae da Amazônia brasileira, *Pera eiteniorum* Bigio & Secco, é descrita e ilustrada. Esta espécie é superficialmente semelhante a *P. tomentosa* (Benth.) Müll. Arg., *P. membranacea* Leal e *P. heteranthera* (Schrank) I. M. Johnst., mas separa-se por ser a única deste grupo a apresentar as seguintes características: face abaxial das folhas com tricomas estrelados e estrelados lepidotos na nervura principal, cálice das flores estaminadas glabros ou raramente com tricomas seríceos esparsos e rudimento de flores pistiladas bem desenvolvido; flores pistiladas com ovário lageniforme, estigma triangular e estaminódio estreitamente oblanceolado. Discussão sobre as afinidades do novo táxon, bem como uma chave para separação das espécies morfológicamente relacionadas da Amazônia brasileira, é apresentada.

**Key words:** Amazonia, Brazil, Euphorbiaceae, IUCN Red List, *Pera*, Peraceae.

*Pera* Mutis is a genus endemic to the Neotropics (Gordillo & Morrone, 2005), encompassing about 30 species (Webster, 1994; Gillespie & Armbruster, 1997), occurring from Cuba and Central America to

southern Brazil (Rio Grande do Sul State). The Amazonian region has the highest species diversity of the genus (Webster, 1994). The genus presents a morphological character that is unique among the Euphorbiaceae: the pseudanthia (a cymose inflorescence), which can be either unisexual or bisexual as exemplified by *P. distichophylla* (Mart.) Baill. and *P. androgyna* Rizzini, consisting of minute flowers enveloped by a fragrant, somewhat globose, showy (yellow, cream, white, and sometimes red) involucral bract. Two species are known to have ethnobotanical uses: *P. glabrata* (Schott) Baill., which is used to make wooden clogs in Brazil (Lorenzi, 1992), and *P. benensis* Rusby, used by the Chimane Indians from Bolivia to treat cutaneous leishmaniosis (Fournet et al., 1992).

The most recent works on *Pera* are those of Gillespie and Armbruster (1997), treating five species of the Guianas, and Gillespie (1999), treating the six species of the Venezuelan Guayana. The most complete work, however, continues to be that of Pax and Hoffmann (1919). Traditionally, *Pera* has been placed in Euphorbiaceae subfam. Acalyphoideae (Webster, 1994). However, recent phylogenetic studies using DNA sequence data have shown that *Pera* and its close relatives are basal to Rafflesiaceae, plus the balance of Euphorbiaceae s. str. (Wurdack et al., 2005; Wurdack & Davis, 2009). In order to recognize the unique characteristics of Rafflesiaceae while preserving family monophyly, some authors have proposed that *Pera* and its relatives be placed as the Peraceae (Stevens, 2001 onward; Souza & Lorenzi, 2008; Wurdack & Davis, 2009). However, APG III (2009) still does not recognize Peraceae as a true family.

In a revision of the *Pera* species occurring in the Brazilian Amazon based on herbarium vouchers, including types from IAN, INPA, MG, R, RB, SP, UB, and UFMT, and photographs of the types from F, G, IAN, K, L, NY, and P, we found diverse specimens differing from the already described



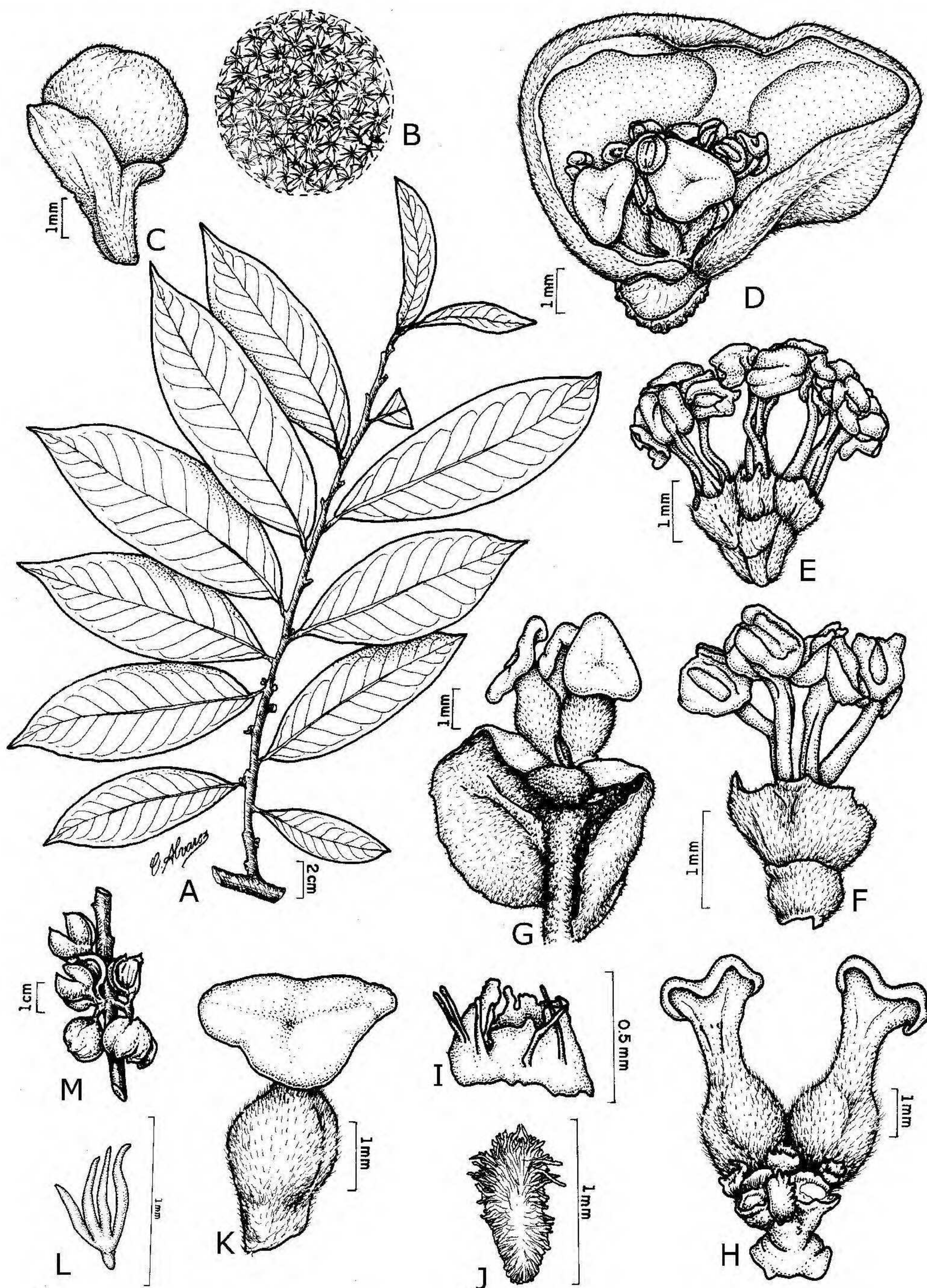


Figure 1. *Pera eiteniorum* Bigio & Secco. —A. Stem with staminate inflorescences. —B. Leaf detail showing the dense indument of stellate trichomes. —C. Immature inflorescence, showing the two bracts present at the base of the involucre. —D. Staminate inflorescence showing involucre completely open at anthesis with the developed, rudimentary pistillate flower. —E. Three staminate flowers with the developed, rudimentary pistillate flower removed. —F. Staminate flower with four stamens, showing the pedicel and the sparse, simple trichomes on the turbinate calyx. —G. Pistillate inflorescence showing the involucre completely open at anthesis and three pistillate flowers. —H. Two of the four pistillate flowers, showing the three basal and rudimentary, sepaloid staminate flowers and the one external, narrowly oblanceolate staminode. —I. Detail of a rudimentary sepaloid staminate flower with sparse, simple trichomes. —J. Detail of a narrowly oblanceolate staminode, with dense indument of stellate trichomes (cf. trichome detail in Fig. 1L), resembling simple trichomes. —K. Pistillate flower with dense indument of



species. This leads to the proposal of a new taxon for the Brazilian Amazon, which is described, illustrated, and discussed below.

***Pera eiteniorum*** Bigio & Secco, sp. nov. TYPE: Brazil. Mato Grosso: Barra do Garças, 254 km along new rd. NNE of village of Xavantina, 6.6 km due S of Base Camp, 12°51'S, 51°45'W, 31 Aug. 1968 (♀ fl., fr.), G. Eiten & L. T. Eiten 8499 (holotype, SP). Figure 1.

Haec species inter congeneros Brasiliae amazonicae quoad folia subcoriacea glandulis patelliformibus abaxialiter carentia, involucrem per anthesin omnino apertum, pseudanthia staminata floribus pistillatis rudimentariis praedita etiam floris pistillati ovarium lageniforme ac stigma integrum *Perae heterantherae* (Schrank) I. M. Johnst. simillima, sed ab ea foliis abaxialiter inter venas indumento denso trichomatum stellatorum ornatis secus costam trichomatibus stellato-lepidotis sparsim vestitis, floris staminati calyce glabro vel raro indumento sericeo trichomatum simplicium sparsis obsito atque floris pistillati staminodio anguste oblanceolato ac stigmate triangulari distinguitur.

Dioecious shrub or tree, ca. 10 m tall, ca. 20 cm diam.; stems covered with stellate-lepidote trichomes when young, becoming glabrous when mature. Leaves alternate, penninerved, 5.5–21 × 1.5–9 cm, lanceolate to elliptic-lanceolate or rarely elliptic, subcoriaceous, margins entire, base cuneate, apex acute to acuminate; adaxial blade surface with stellate trichomes concentrated on the midvein, the remaining blade glabrous or with few stellate trichomes; abaxial blade surface with a dense indument of stellate trichomes, the midvein with sparse stellate-lepidote trichomes, the veins prominent, glands absent; petiole 0.3–1 cm, canaliculate to slightly canaliculate, pilose, with indument of stellate trichomes. Inflorescences either staminate or pistillate in fasciculate pseudanthia, peduncle with lepidote-stellate trichomes, densely grouped, involucre globose before anthesis, completely opened at anthesis, bracteoles 2 at base of involucre, orbicular, opposite, with dense indument of lepidote-stellate trichomes; staminate peduncle 2–4 mm, bracteole ca. 0.5–1 mm diam.; pistillate peduncle 3–5 mm, bracteole 1–1.5 mm diam. Staminate flowers 3 per pseudanthium, pedicels 0.3–0.6 mm, petals absent, calyx turbinate, 5-lobate, the lobules 0.5–0.6 mm, concrescent at base, apex lacerate, glabrous or rarely with sericeous indument of sparse, simple trichomes,

stamens 3 or 4 per flower, filaments 2–2.5 mm, connate for 1/2 their length, glabrous, anthers 2–3 mm, rimose, dorsally fixed, with 4 developed rudimentary pistillate flowers, 1.5–2 mm, lageniform, densely tomentose, trichomes stellate, stigma triangular. Pistillate flowers 4 per pseudanthium, subsessile, pedicels ca. 0.2 mm, sepals and petal absent, with 3 rudimentary sepaloid staminate flowers, urceolate, ca. 0.3–0.5 mm, with simple, sparse trichomes and a narrowly oblanceolate staminode, 0.8–1 mm, with a dense indument of stellate trichomes, ovary 1–1.3 mm diam., lageniform (flask-shaped), densely tomentose, trichomes stellate, with 1 ovule per locule, style 0.3–1 mm, stigma entire, triangular, the abaxial surface tomentose, adaxially glabrous, papillose. Fruit 1–1.5 cm diam., globose, mericarps 3, dilated, pilose, trichomes stellate, pedicel 3–5 cm; seeds 6–7 × 4–5 mm, 1 per locule, ovoid, base cuneate, apex roundish, carunculate, caruncle orange, covering 2/3 of seed.

**Distribution and habitat.** Known from the Brazilian states of Pará, Rondônia, and Mato Grosso, the distribution of *Pera eiteniorum* is concentrated in southwestern Amazonia (Prance, 1994). The taxon is found in transitional areas between cerrado (savanna) and Amazonian forest, occurring also in terra firme forest (never flooded), riparian forest, and capoeira (secondary forest), usually on sandy soils.

**IUCN Red List category.** *Pera eiteniorum* is assessed here as Least Concern (LC) according to IUCN Red List criteria (IUCN, 2001).

**Phenology.** Flowering in the new species occurs from September to February, and fruiting takes place from February to October.

**Etymology.** The specific epithet honors the botanist George Eiten (1923–), who studied in-depth the phytogeography of the Brazilian cerrado. He and his wife, Liene Eiten (1925–1979), were the first to collect the described species in a transition zone between the cerrado and the Amazonian forest.

**Common names.** *Pera eiteniorum* has been called “caferana” and “feijão de arara” in Mato Grosso State (Bigio, pers. obs.).

**Discussion.** Based on the involucre being completely open at anthesis, the staminate flowers with well-developed rudimentary pistillate flowers, and the

← stellate trichomes on the ovary (cf. trichome detail in Fig. 1L), resembling simple trichomes. —L. Detail of a stellate trichome as found on the ovary and on the narrowly oblanceolate staminode. —M. Detail of the stem with several fruits. A–C, E drawn from R. M. Harley & R. Castro 10941 (UB); D, F from M. N. Ivanuskas 4069 (SP); G from J. A. Ratter et al. R8088 (UB, UFMT); H–J from E. S. Lima et al. 149 (SP, UB); and K–M from the holotype G. Eiten & L. T. Eiten 8499 (SP).



pistillate flowers with an entire stigma, *Pera eiteniorum* must be placed in *Pera* sect. *Spixia* Müll. Arg. In this section, *P. eiteniorum* is morphologically close to *P. heteranthera* (Schrank) I. M. Johnst., but can be distinguished by the stellate trichomes on the abaxial leaf surface; the staminate flowers with the calyx completely glabrous or with sparse, simple trichomes; and the pistillate flowers with a triangular stigma and a narrowly oblanceolate staminode. *Pera eiteniorum* is also morphologically close to *P. membranacea* Leal, also in section *Spixia*, but can be distinguished by the subcoriaceous leaves that lack patelliform glands on the abaxial surface and have a dense indument of stellate trichomes on the abaxial surface, as well as the pistillate flowers with lageniform ovaries and the presence of the staminode. The leaf indument of *P. eiteniorum* is similar to that of *P. tomentosa* (Benth.) Müll. Arg., which is placed in *Pera* sect. *Neopera* Griseb.; however, *P. eiteniorum* has the involucre completely open at anthesis, the staminate flowers with developed, rudimentary pistillate flowers, and the pistillate flowers with an entire stigma. In some species of *Pera*, the stellate trichomes are distributed in clusters and have erect arms, giving the appearance of simple trichomes. This can be observed in *P. eiteniorum* (Fig. 1J, L). Structures such as the rudimentary pistillate and staminate flowers in *Pera* are defined according to Pax and Hoffmann (1919) and Radcliffe-Smith (2001). Details about the main morphological differences among *P. eiteniorum* and related species may be observed in the key.

**Paratypes.** BRAZIL. **Mato Grosso:** próx. ao Rio Suiazinho, a 290 km NNW de Nova Xavantina, aprox. 12°50'S, 51°53'W, 4 Sep. 1972 (♂ fl.), *J. A. Ratter et al.* R2331 (UB); Ribeirão Cascalheira, perto da junção da estrada para Querência com BR-158, aprox. 10 km N de Ribeirão Cascalheira, 12°43'S, 51°53'W, 19 Aug. 1998 (♀ fl., fr.), *J. A. Ratter et al.* R8088 (UB, UFMT); Exped. Base Camp, 12°49'S, 51°46'W, 5 Nov. 1968 (fl.), *R. M. Harley et al.* 10940 (UB); Exped. Base Camp, 12°49'S, 51°46'W, 5 Nov. 1968 (♂ fl.), *R. M. Harley et al.* 10941 (UB); Exped. Base Camp, 5 km ao S, 12°54'S, 51°52'W, próx. rodovia Nova Xavantina a São Felix, 2 May 1968 (fr.), *R. R. de Santos* 1245 (UB); Exped. Base Camp, 6 km ao N, 12°54'S, 51°52'W, próximo a rodovia Nova Xavantina a São Felix, 25 Apr. 1968 (fr.), *A. Ferreira et al.* 1188 (UB); Ribeirão Cascalheira, estrada ao mpio. Querência, ca. 4.7 km a partir da BR 158, 22 Aug. 1997 (♀ fl.), *E. S. Lima et al.* 149 (SP, UB); Sinop próx. entrada para Vera, 7 Nov. 1995 (♂ fl.), *M. Macedo et al.* s.n. (UFMT); Sinop próx. Rio Nandico, 30 May 1995 (fr.), *M. Macedo et al.* 4163 (UFMT); Rio Aripuanã, próx. centro Humboldt, descendo do Salto dos Dardanelos, 59°21'S, 10°12'W, 14 Oct. 1973 (fr.), *C. C. Berg et al.* P18515 (MG, UFMT); Estação Ecológica Iquê-Juruena, 8 Aug. 1981 (fr.), *G. Guarim-Neto et al.* 549 (UFMT); Estr. Xavantina-Cachimbo, 5 km W do Km 264 da rodovia, 20 Mar. 1968 (fr.), *D. Philcox et al.* 4591 (UB); margem da BR-80, Rod. Xavantina-Cachimbo, 10°33'S,

53°44'W, 18 Oct. 1977 (fr.), *B. C. dos Passos* 1012 (MG, RB); Pontes de Lacerda 9 km NW de Pontes e Lacerda, BR 364 para Vilhena, 15°10'S, 59°25'W, 31 Oct. 1985 (♂ fl.), *W. Thomas et al.* 4735 (MG); Sinop, 3–6 km E of BR 163 on rd. N of Rio Celeste (UFMT 225), 51 km S of Sinop, 12°18'S, 55°34'W, 17 Sep. 1985 (fl.), *W. Thomas et al.* 3842 (MG); Gaúcha do Norte, área urbana, 13°10'S, 53°15'W, 13 Aug. 1999 (♂ fl.), *N. M. Ivanuskas* 4069 (SP); Dardanelos, Rio Aripuanã, estr. Sta. Helena, 17 June 1974 (fr.), *M. R. Cordeiro* 129 (RB). **Pará:** Missão Cururu, 9 May 1977 (♂ fl.) *N. A. Rosa et al.* 1863 (MG, RB); Missão Cururu, above Lago dos Ciganos, E of Missão, 7°35'S, 57°31'W, 6 Feb. 1974 (♀ fl., fr.), *W. R. Anderson* 10565 (RB). **Rondônia:** cerrado a 21 km de Presid. Médici, margem esquerda da BR 364, 27 Mar. 1986 (♂ fl.), *N. A. Rosa et al.* 4997 (MG); Vilhena, 13°43'S, 59°20'W, 17 Apr. 77 (fr.), s. coll. s.n. (RB); Pimenta Bueno, margem do Rio Comemoração, 12°02'47"S, 60°37'39"W, 26 Jun. 1998 (fr.), *I. Miranda* 2076 (MG).

#### KEY TO SPECIES OF *PERA* IN AMAZONIAN BRAZIL

##### MORPHOLOGICALLY CLOSELY RELATED TO *PERA EITENIORUM*

- 1a. Involucre of the inflorescence opening through a longitudinal aperture at anthesis; the staminate flowers without developed, rudimentary pistillate flowers; pistillate flowers with trifid stigmas...  
..... *P. tomentosa*
- 1b. Involucre of the inflorescence completely opened at anthesis; the staminate flowers with developed, rudimentary pistillate flowers; pistillate flowers with entire stigmas.
  - 2a. Leaves membranous, with patelliform glands on the abaxial blade surface; pistillate flowers with a pyriform ovary and staminodes absent  
..... *P. membranacea*
  - 2b. Leaves subcoriaceous to coriaceous, glands absent on the abaxial blade surface; pistillate flowers with a lageniform ovary and staminodes present.
    - 3a. Abaxial leaf surface, including the midvein, with indument of porrect-stellate trichomes; calyx of the staminate flower with ciliate margin of simple trichomes; pistillate flower with an umbraculate stigma and no staminode  
..... *P. heteranthera*
    - 3b. Abaxial leaf surface with dense indument of stellate trichomes and with sparse stellate-lepidote trichomes on the midvein; calyx of the staminate flower glabrous or rarely with sericeous indument of sparse, simple trichomes; pistillate flower with a triangular stigma and a narrowly oblanceolate staminode  
..... *P. eiteniorum*

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new taxon. Thanks are due to the Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq) for the fellowship grants provided to the authors, and to Lynn Gillespie, Geoffrey A. Levin, and Victoria C. Hollowell for their excellent suggestions for revisions to the manuscript.

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